FORM PTO-1390 (REV. 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 047.0057

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): 09/936464

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/02128	March 10, 2000	March 12, 1999

TITLE OF INVENTION: TUFTING-MACHINE

APPLICANT(S) FOR DO/EO/US: Jonathan W. Clarke and Warren J. Meade

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [ ] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below
4. [ ] The US has been elected by the expiration of 19 months from the priority date (Article 31)
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is attached hereto (required only if not communicated by the International Bureau).
   b. [X] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [ ] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is attached hereto
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4)
7. [X] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau)
   b. [X] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3))
9. [ ] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))
10. [ ] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included
13. [ ] A FIRST preliminary amendment
14. [ ] A SECOND or SUBSEQUENT preliminary amendment
15. [ ] A substitute specification
16. [ ] A change of power of attorney and/or address letter
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825
18. [ ] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [ ] Other items or information:

U.S. APPLICATION NO (If known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/936464	PCT/EP00/02128	047.0057

21. [X] The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):	CALCULATIONS PTO USE ONLY
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $1000.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $860.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $710.00	
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) $690.00	
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00	
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	8 - 20 =		x $18.00	$
Independent claims	1 - 3 =		x $80.00	$
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $270.00	$ 270.00
TOTAL OF ABOVE CALCULATIONS =				$ 1130.00
[ ] Applicant claims small entity status See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			+	$
SUBTOTAL =				$ 1130.00
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$
TOTAL NATIONAL FEE =				$
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$
TOTAL FEES ENCLOSED =				$ 1130.00
			Amount to be refunded:	$
			charged:	$

a. [X] A check in the amount of $ 1130.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees A duplicate copy of this sheet is enclosed.

c. [ ] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No _____ A duplicate copy of this sheet is enclosed.

d. [ ] Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO

PURDUE LAW OFFICES
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David C. Purdue
SIGNATURE

David C. Purdue
NAME

31,412
REGISTRATION NUMBER

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of Jonathan W. Clarke et al.	)	
Serial No. 09/936,464	)	
Filed:	)	
For: TUFTING-MACHINE	)	Attorney Docket: 047.0057

PRELIMINARY AMENDMENT

Prior to examination, please amend the subject applications as follows:

In the Claims:

Please cancel claims 4 through 7 and enter the following new claims 8 through 25:

8. (New) A method for operating a tufting machine comprising at least one double-sliding needlebar, loopers or hooks to pick up yarn delivered through needles supported on the at least one double-sliding needle-bar, knives to cut loops of yarn formed by the loopers or hooks, and driving means, said method being characterized in that the movement of the at least one double-sliding needlebar, the movement of the loopers or the hooks, or the movement of the knives is non-simple harmonic motion and, further characterized in that the at least one double-sliding needlebar dwells or halts when the needles stand at top dead center so that the needles do not tag the back-stitches.

9. (New) The method claimed in claim 8, further characterized in that the double-sliding needlebar dwells or halts when the needles stand at the pick-up point, so that the pick-up of the yarn by the loops or hooks is assisted.

10. (New) The method claimed in claim 8 or 9, further characterized in that the at least one double-sliding needlebar dwells or halts when the needles stand above the backing to extend the time available for feeding of the primary backing fabric.

11. (New) The method claimed in claim 1, 2, 8 or 9, further characterized in that the loopers are

held extended to hold the loops until later in the tufting cycle.

12. (New) The method claimed in claim 3, further characterized in that the loopers are held extended to hold the loops until later in the tufting cycle.

13. (New) The method claimed in claim 10, further characterized in that the loopers are held extended to hold the loops until later in the tufting cycle.

14. (New) The method claimed in claim 1, 2, 8 or 9, further characterized in that the hooks are held extended to hold the loops until later in the tufting cycle.

15. (New) The method claimed in claim 3, further characterized in that the hooks are held extended to hold the loops until later in the tufting cycle.

16. (New) The method claimed in claim 10, further characterized in that the hooks are held extended to hold the loops until later in the tufting cycle.

17. (New) The method claimed in claim 1, 2, 8 or 9, further characterized in that the knives are advanced to cut the loops at a point where the loops always have the same length.

18. (New) The method claimed in claim 3, further characterized in that the knives are advanced to cut the loops at a point where the loops always have the same length.

19. (New) The method claimed in claim 10, further characterized in that the knives are advanced to cut the loops at a point where the loops always have the same length.

20. (New) The method claimed in claim 11, further characterized in that the knives are advanced to cut the loops at a point where the loops always have the same length.

21. (New) The method claimed in claim 12, further characterized in that the knives are advanced to

cut the loops at a point where the loops always have the same length.

22. (New) The method claimed in claim 13, further characterized in that the knives are advanced to cut the loops at a point where the loops always have the same length.

23. (New) The method claimed in claim 14, further characterized in that the knives are advanced to cut the loops at a point where the loops always have the same length.

24. (New) The method claimed in claim 15, further characterized in that the knives are advanced to cut the loops at a point where the loops always have the same length.

25. (New) The method claimed in claim 16, further characterized in that the knives are advanced to cut the loops at a point where the loops always have the same length.

REMARKS

It is noted that claims 4 through 7 where improper multiple dependent claims. Accordingly, these claims are canceled and new claims 8 through 25 are presented for consideration.

Favorable action is solicited.

Respectfully submitted,

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PCT/EP00/02128

CLAIMS

1. Method for running a tufting machine having at least one needlebar, loopers and/or hooks to pick up yarn delivered through the needles of the needlebar, knives to cut the yarn loops and driving means, **characterized** in that the needle action and/or the looper action and/or the hook action and/or the knife action is/are a non-simple harmonic motion.

2. Method for running a tufting machine according to claim 1, characterized in that the needlebar(s) are slowed or halted when the needles stand at the pick-up point to assist the looper or the hooks to pick up the yarn from the needles.

3. Method for running a tufting machine according to claim 1 or 2, characterized in that the needlebar(s) are slowed or halted when the needles stand above the backing to extend the time available for feeding of the primary backing fabric.

4. Method for running a tufting machine according to one of the preceding claims, using a double-sliding needlebar, characterized in that the needlebar(s) are slowed or halted when the needles stand in the top dead center to avoid the needles tagging the back-stitches.

5. Method for running a tufting machine according to one of the preceding claims, characterized in that the loopers are held extended to hold the loops until later in the tufting cycle.

TUFTING-MACHINE

FIELD OF THE INVENTION

The invention relates to a tufting machine having at least one needlebar, loopers to pick up yarn delivered through the needles of the needlebar(s), and driving means.

BACKGROUND TO THE INVENTION

The action of a needlebar in a tufting machine is controlled by a main drive. Usually the drive is direct coupled and, although antivibration decoupled drive systems have evolved out of recent research to develop high speed tufters, to the best of the applicants` knowledge all needlebars follow a simple harmonic motion, oscillating between top-dead-center (TDC) and bottom-dead-center (BDC) on a regular sinusoidal path.

The pick-up of yarn off the needle, due to a looper or hook is a critical part of a tufting action which is best achieved slightly after the needle has passed BDC. Halting or slowing the needle at this point would assist the looper respectively hook yarn pick-up.

In the case of double-sliding needlebar tufters, excess top stroke is required to enable the lateral needlebar shifts to take place and avoid backstitch "tagging" as the needle moves down toward BDC. This can result in loose and uneven backstitches. Similarly, excess bottom stroke is also required to enable clean pick-up of the yarn from both the front and back needlebars. This can cause problems with evenness of the pile surface and so results in a product with lower quality.

Adjustment of the top and bottom needlebar stroke influences the surface and the back-stitch of a tufted carpet. The means of adjustment of current needlebar strokes

are generally very crude and often involving (sometimes non-ideal) quantum step adjustments.

Although intermittent feed of the primary backing is possible with modern tufting machines it is still possible, that the backing movement interferes with the needle stroke. This means while the backing material moves while the needle is still in the backing material. This system causes stresses on the tufting machine, the tufting needle and carpet primary backing. The stresses on the machine cause, for example, increased power usage and premature machine wear. The stress on the needle can cause needle breakage. The stresses on the carpet backing cause distortion of the structure of the primary backing which in turn can lead to problems with, for example, carpet dimensions. In the case where intermittent primary backing feed was used, the time available for backing feeding is limited. In the case where continues primary backing feed was used, this stress is even more critical, and can cause severe damages or is the reason for low quality carpet production. In case of producing cut pile carpet the pick up of yarn off the needle after the needle has passed the BDC is done by a hook. Several yarn loops are collected on the hook and are cut by a knife to produce the cut pile carpet. Both motions, the hook motion and the knife motion are of simple harmonic motion and being steadily sine-shaped.

The action of a looper, a hook or a knife in a tufting machine is controlled by a main drive. The coupling between a looper bar, a hook bar and a knife bar supporting a plurality of loopers, hooks or knives in a tufting machine and the main drive may be direct or through other mechanical systems to reduce inertia and vibration but, to the best of the applicants' knowledge, the loopers, the hooks and the knives follow a simple harmonic motion on a regular sinusoidal path..

The most common looper action follows an arc whereby the loopers are "rocked" out(or oscillated) to a pick-up point and back to a position to clear needles of the tufting machine. Patents for a linear motion looper action US Patent No. 5645001 and 4759199 (assignee Tuftco) have been found. With both arcuate and linear motion the timing of the looper action is critical for good tufting. Furthermore the way in which the looper picks the yarn off the needle, holds it while the needle withdraws and casts off the loop have significant effect on a carpet surface produced in a tufting machine. Same thing is true and valid for the motion of the hook action and the motion of the knife action.

Looper, hook and knife motion timing and set-up are relatively frequently adjusted parameters with different carpet qualities requiring different settings for these parameters.

The means of adjustment of the looper, hook and knife action for timing and pick-up are generally very crude, in some cases involving releasing mounting clamps and knocking the looper, hook and knife assembly into another position with a hammer.

An object of the invention is to overcome the identified disadvantages, provide an alternative choice and improve the action and performance of the needlebars, hooks, knives and loopers of a tufting machine.

Further objects of the invention will become apparent from the following descriptions.

SUMMARY OF THE INVENTION

According to a broadest aspect of the invention there is provided a tufting machine in which the needle action and/or the action of the loopers, hooks and knives is a non-simple harmonic motion, that is a non-sinusoidal motion

A non-simple harmonic action (n-SHM) needlebar action would also have significant advantages.

Mechanical systems (e.g. cams) can be used to achieve an n-SHM needle action with significant improvements in comparison to conventional needlebar actions. The greatest advantages for an n-SHM needlebar drive system would be achieved through the use of a computer controlled drive system.

The looper, or/and hook or/and knife action, ease of set up and fine tuning can be greatly improved by decoupling the looper, hook and knife drive system from the main drive of the tufting machine. A non-simple-harmonic-motion (n-SHM) drive can be used to give significant advantages for the looper, hook and knife motion.

Mechanical systems (e.g. cams) can be used to achieve n-SHM motion action with significant improvements in comparison to the conventional motion action to move the looper or/and the hook or/and the knives in their advanced and retracted positions. The greatest advantages for a decoupled drive system would be achieved through the use of a computer controlled drive system.

PREFERRED EXAMPLES

As an example, for a comparison between conventional simple harmonic needle and looper action and the non-simple harmonic needle and looper action of the present invention is shown in the accompanying drawing in which:

Figure 1 shows conventional simple harmonic needle and looper action.

Figure 2 shows an example of path for the non-simple harmonic motion for a needle with the (SHM) looper path shown as well.

Figure 3 shows an example of a non-simple harmonic motion for a looper with the (SHM) needle path shown as well.

The shown looper motions are examples and can be substituted by motions for the hooks and the knives.

In Figure 1 the needle oscillates between top dead center (TDC) and bottom dead center (BDC) with a SHM. The looper oscillates between fully extended and fully retracted with a SHM.

Using an n-SHM needlebar action would enable the needle to be slowed, or halted, at the pick-up point to assist the looper to pick up the yarn from the needle.

An n-SHM needlebar action could also be used to reduce the amount of time that the needle is in the backing (as a percentage of the needle stroke time) which would lead to reduced stress on the tufting machine and reduced distortion of the carpet primary backing.

Although in theory it is possible to vary the distance between rows of tufts (i.e. stitch rate), in practice there is a practical limit on the extent of variation for any given top stroke setting of the needlebar, i.e. limited by the time that the needles are out of the backing. Using an n-SHM needlebar action, the needles could be slowed, or halted, above the backing to extend the time available for increased distance between rows of tufts.

In the case of intermittent primary backing feeding, an n-SHM needlebar action would allow more time for the backing advance to take place, i.e. when the needle was not in the carpet backing.

In the case of double sliding needlebar tufting machines an n-SHM needlebar action which slowed, or halted, the needle at TDC could be used to ensure that the needles

would not "tag" the backstitches without excess top stroke which would, in turn, result in tighter, more even backstitches. Furthermore, the use of an n-SHM needlebar action which slowed, or halted, the needle at the pick-up could be used to ensure good yarn pick-up without excess bottom stroke which would, in turn, result in a more even carpet surface.

A computer controlled needlebar drive system would also enable the action to be electronically fine-tuned to a high level of precision. Different set ups could be achieved automatically for a different product as is currently done for other tufting parameters, such as yarn feed, pile height, primary backing feed, etc, as in US 4867080.

Patterning effects may also be possible through variation of the needlebar stroke between rows of the same product.

It is expected that an n-SHM needlebar action would also lead to reduced machine vibration, which in turn, could enable higher speed operation. Further advantages could also be accrued through the use of shorter needlebar strokes and intermittent needlebar action.

A non-simple-harmonic-motion looper action enables more precise control of the timing for the looper extension to pick-up the yarn from the needle at the optimum position on the needle. Furthermore, the looper can remain "extended" to hold the loop until later in a tufting cycle, i.e. until the backing has advanced on to trap the backstitch under the presser foot to reduce the tendency for yarn to be "robbed-back" as the next tuft is inserted.

In more sophisticated versions, the looper can "track" the tuft at the same speed as the backing advance to maintain the loop height, shape, etc.

A computer controlled looper drive system also enables the action to be electronically fine-tuned to a high level of precision. Different set ups can be achieved automatically for a different product as is currently done for other tufting parameters, such as yarn feed, pile height, primary backing feed, etc, as in US 4867080.

Patterning effects may also be possible through pile height control and variation by the modified action of the looper.

It is expected that an n-SHM looper action would also lead to reduced machine vibration, which in turn, could enable higher speed operation. Further advantages should also accrue through the use of shorter looper strokes and intermittent (compared with continuous) looper action.

The foregoing description particular refers to the looper motion it is envisaged that the advantages on the looper motions are also valid for the motions of the hooks and the knives. Precise and timely adjusted n-SHM knife motion will assure a good precise cutting of the loops which will result in high quality cut pile carpet.

Where in the foregoing description particular reference has been made to mechanical equipment it is envisaged that their mechanical equivalents can be substituted as if they were individually set forth.

Particular examples of the invention have been described and it is envisaged that improvements and modifications can take place without departing from the scope thereof.

6. Method for running a tufting machine according to one of the preceding claims, characterized in that the hooks are held extended to hold the loops until later in the tufting cycle.

7. Method for running a tufting machine according to one of the preceding claims, characterized in that the knives are moved forward to cut the loops at a point where they always have the same length.

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

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D05C 15/20, 15/22, 15/24

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334620	12 March 1999 (12.03.99)	NZ

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(81) Designated States: JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: TUFTING–MACHINE

(57) Abstract

The invention concerns a tufting machine having at least one needlebar, loopers, hooks to pick up yarn delivered through the needles of the needlebar, knives to cut yarn loops and driving means, with the needle action and/or the looper action and/or the hook action, and/or the knife action being a non–simple harmonic motion. In said machine the needles, the hooks, the knives and the loopers have separate drive systems. So the motion of the needles, the hooks, the knives and the loopers can be such that first of all the pickup of the yarn or the cutting of the yarn loop can be improved. When the drive system is computer controlled more accurate machine set up can be achieved. Moreover different set ups can be achieved automatically for different products. Patterning effects are also possible.

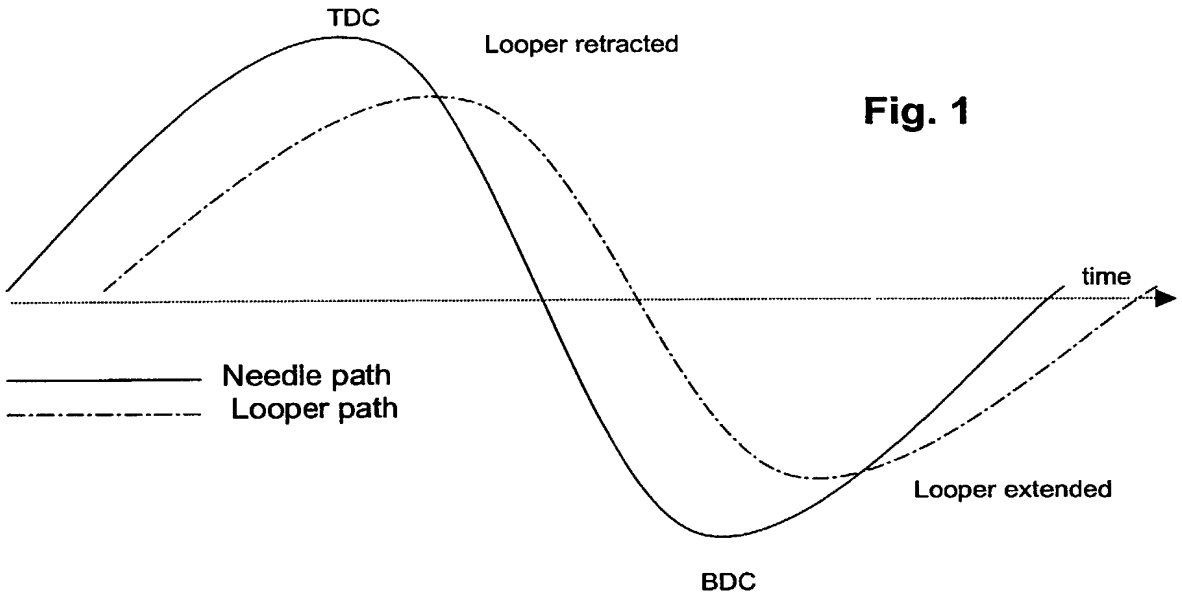
TDC
Looper retracted
time
Needle path
Looper path
Looper extended
BDC

Fig. 1

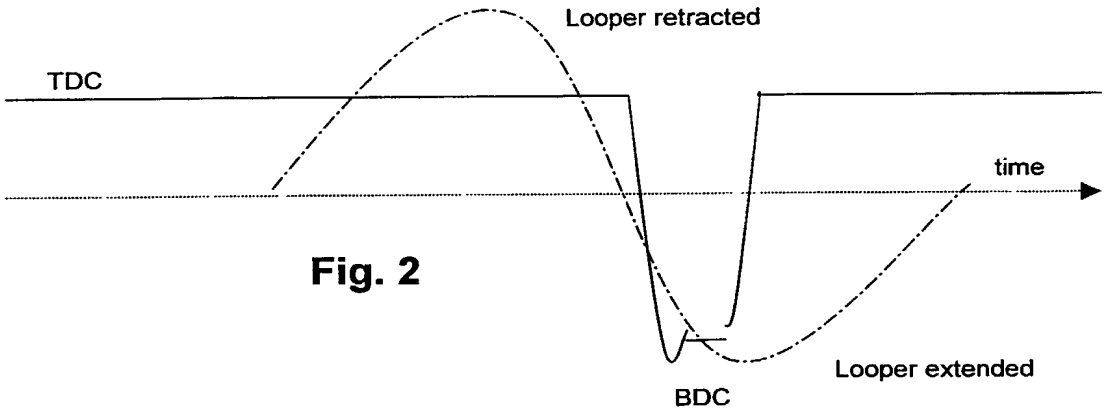

Fig. 2

Needle path
Looper path

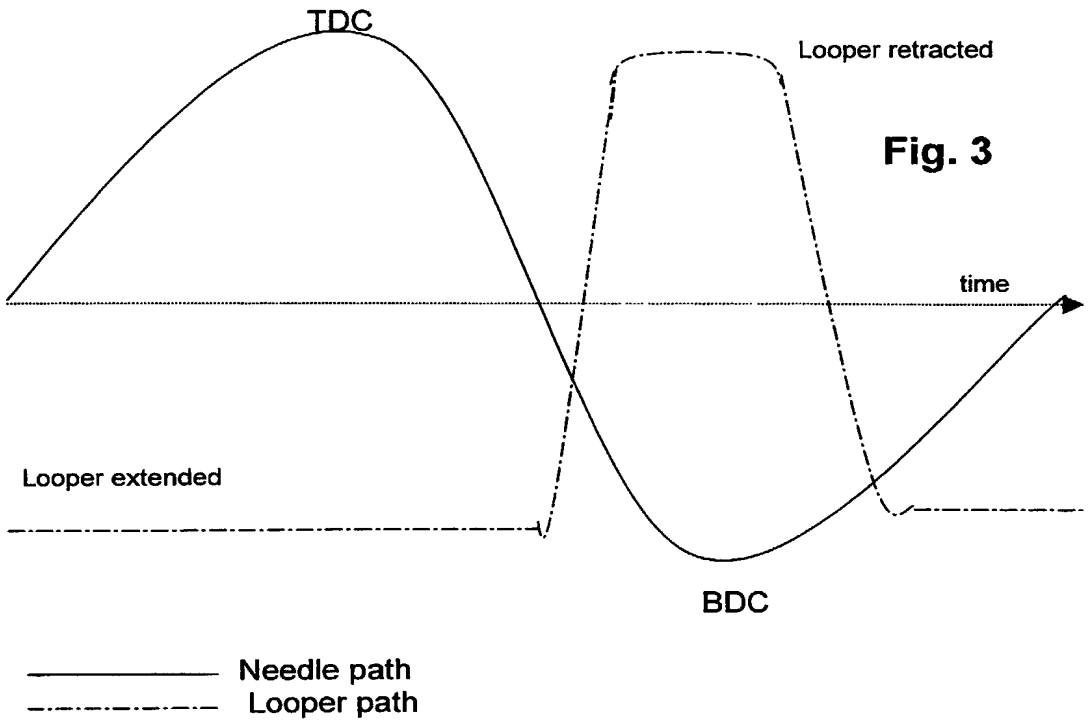
TDC
Looper retracted
time
Looper extended
BDC
Needle path
Looper path

Fig. 3

PTO/SB/01 (10-01)
Approved for use through 10/31/2002. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing OR ☑ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	
First Named Inventor	
COMPLETE IF KNOWN	
Application Number	09/936,464
Filing Date	09/12/2001
Art Unit	
Examiner Name	

As the below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original and first inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TUFTING-MACHINE

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☑ was filed on (MM/DD/YYYY) 03/10/2000 as United States Application Number or PCT International Application Number PCT/EP00/02128 and was amended on (MM/DD/YYYY) 05/19/2001 (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT International application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	Certified Copy Attached? NO
334619	NZ	03/12/1999	☐	☐	☑
334620	NZ	03/12/1999	☐	☐	☑
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

PTO/SB/01 (10-01)
Approved for use through 10/31/2002. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DECLARATION — Utility or Design Patent Application

Direct all correspondence to: ☐ Customer Number or Bar Code Label [ ] OR ☐ Correspondence address below

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR : ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle (if any)): Jonathan William
Family Name or Surname: CLARKE

Inventor's Signature: [signature] Date: 13/6/02

Residence: City: Christchurch NZ | State | Country: NZ | Citizenship: NZ

Mailing Address: 57 McBeath Ave, Christchurch

City: Christchurch | State | ZIP | Country: NZ

NAME OF SECOND INVENTOR: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any]): Warren John
Family Name or Surname: MEADE

Inventor's Signature: W. Meade Date: 17/6/2002

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☐ Additional inventors are being named on the ____supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.